GROUP 54A

CHASSIS ELECTRICAL

CONTENTS

GENERAL INFORMATION

M2540000100261

The adoption of new accessories and functions has enhanced a lineup of equipment.

FEATURES

ENHANCED VISIBILITY AND SAFETY

ENHANCED EASE-OF-USE AND CONVENIENCE

- The engine immobilizer system with the improved security system has been applied, and the immobilizer-ECU is integrated with ETACS-ECU.
- The large four headlamps with the lightweight resin lenses have been adopted.
- The day time running light (DRL) is installed as an option for several models.
- The high-mounted stop lamp has been installed on the tailgate for all models.
- Reliable information transmission can be achieved by connecting the combination meters, and centre display and each ECU via CAN communication.
- The combination meters are provided integrated with a perfect round-shaped speedometer where the needles operate at the wider angle.

IMPROVEMENTS IN SERVICEABILITY

- Installation of two diagnosis connectors for MUT-III inspection.
- Integration of diagnosis and service data in the combination meter and the centre display, enabling communication with MUT-III.

IMPROVEMENTS IN COMMERCIAL VALUE

- A new communication protocol, LIN (Local Interconnect Network), is applied as the inter-vehicle communication for the lamp control with the lighting switch.
- The centre display is installed to display with characters outside air temperature, vehicle information (average speed, instant fuel consumption, remaining distance), clock, and audio information.
- Accessory sockets are added.
- In dash 6 disc CD changer is installed as an option.
- The remote controlled radio switch is installed to the steering wheel as an option.

DIAGNOSTIC SYSTEM

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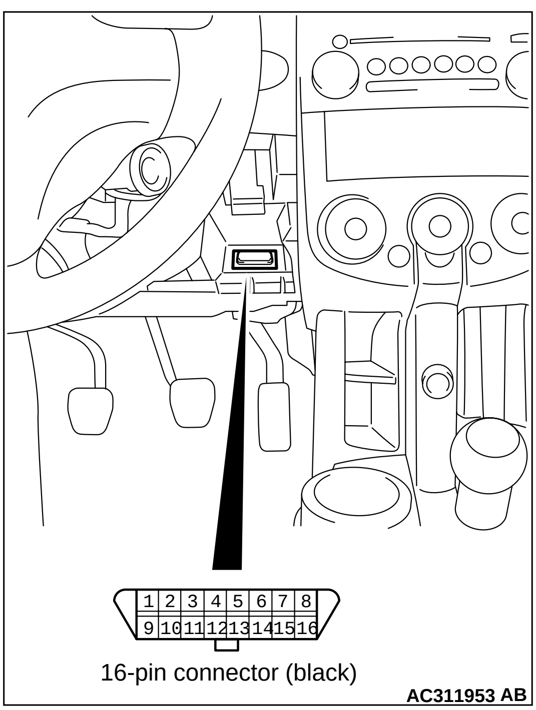
Service quality has been improved by fitting diagnosis connectors for the MUT-III inspection near the left knee area of the driver's seat on the instrument panel.

Diagnostic Function	MPI	Automated Manual Transmission	ABS	Active Stability Control	SRS
Diagnosis code set	×	×	×	×	×
Output of service data	×	×	×	×	×
Actuator test	×	×	×	×	–
Diagnosis record stored	×	×	×	×	×
Erasure of diagnosis code by the MUT-III	×	×	×	×	×
Status indication by diagnosis code*	–	–	×	×	–
Estimated vehicle speed sent	–	–	–	–	–
ECU information display	–	–	×	×	–

Diagnostic Function	Electric Power Steering	Immobilizer	Combination meter	Multi centre display	ETACS	A/C
Diagnosis code set	×	×	×	×	×	×
Output of service data	×	×	×	–	–	×
Actuator test	×	–	×	–	–	×
Diagnosis record stored	×	×	×	×	×	×
Erasure of diagnosis code by the MUT-III	×	×	×	×	×	×
Status indication by diagnosis code*	–	–	×	–	–	×
Estimated vehicle speed sent	–	–	× (via CAN)	× (via CAN)	× (via CAN)	–
ECU information display	–	–	×	–	–	×

*NOTE: *If a diagnosis code is sent for this function, the display informs users whether a mechanical problem currently exists or whether it existed before but normal operation has been restored. The message for the former state identifies it as a current trouble and the message for the latter identifies it as a past trouble.*

DIAGNOSIS CONNECTORS



Diagnosis connector	
1	–
2	–
3	–
4	Earth
5	Earth
6	CAN communication line (CAN_H)
7	MPI, Automated Manual Transmission
8	–
9	–
10	–
11	ECU optimisation control
12	–
13	–
14	CAN communication line (CAN_L)
15	–
16	Battery power supply

BATTERY

M2540002000237

Light and compact batteries have been adopted.

SPECIFICATION

Item	54203	56103
Voltage V	12	12
Capacity (20-hour rate) Ah	42	61
Electrolytic fluid specific gravity (fully charged state at 20°C)	1.280	1.280

IMMOBILIZER SYSTEM

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The engine immobilizer system prevents the engine from starting and immobilizes the vehicle if a key other than the key registered for that vehicle is used in an attempt to start the engine after forced entry. The engine immobilizer system consists of the ignition key, key ring antenna, immobilizer-ECU, and engine-ECU <M/T> or engine automated manual transmission electronic control unit (engine-A-M/T-ECU) <automated manual transmission>. It works in the following way and has these functions.

1. With the ignition key turned ON, the transponder (a small transmitter) integrated in the ignition key transmits its own ID code to the key ring antenna via radio wave.
2. According to the sent ID code, the ETACS-ECU controls the engine-ECU <M/T> or engine-A-M/T-ECU <automated manual transmission> only when the sent ID code agrees with the pre-registered one.
3. The system is designed to be maintenance-free because the power source for the transponder is supplied by the key ring antenna. Three ignition keys are provided, and up to eight keys can be registered to one vehicle as needed. More than one trillion of ID code combinations can be registered, and parts of them are irregularly changed whenever the ignition key is turned ON. This feature prevents code copying, resulting in higher security of the system.

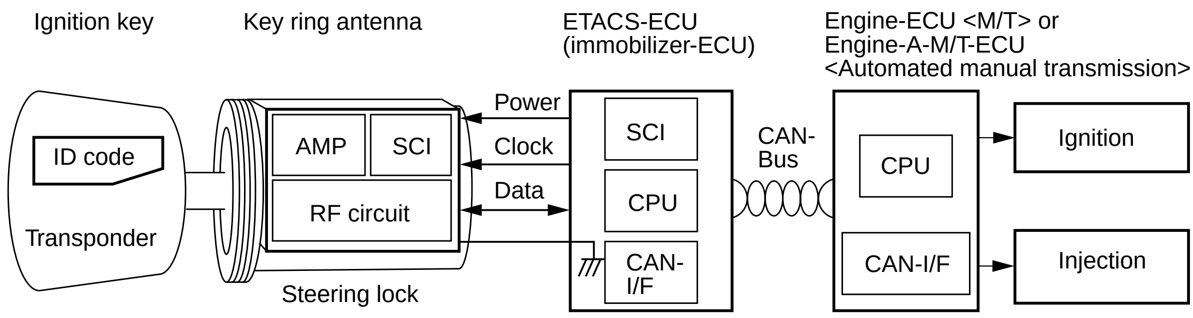
NOTE: In case of replacement of the ETACS-ECU, or loss or addition of the ignition key, all key ID codes should be registered again using MUT-III as follows.

- *In case of loss of the ignition key, all keys except the lost one should be registered again for eliminating the registration of the lost key.*
- *For addition of a key, all the keys to be used afterwards including the added key should be registered again.*

DIAGNOSIS CODE TABLE

Diagnosis code No.	Diagnosis item
B1721	Base station failure
B1722	Antenna failure
B1723	Transponder communication failure
B1725	Wrong data/random number in CAN message
B1726	Too much challenges received
B1730	Key out of sync
B1731	Immobilizer communication failure

CONSTRUCTION DIAGRAM



AC312166 AB

MAIN COMPONENTS

Component name	Outline of function
Transponder	Is power-supplied by the key ring antenna. When the transponder receives random number data, it processes it and the encrypted code. Then it transmits the process result to the ETACS-ECU.
Key ring antenna (included an amplifier)	The ETACS-ECU supplies power via an antenna on a steering lock by transmission of electromagnetic waves to a transponder built into a key, using magnetic coupling
ETACS-ECU (immobilizer-ECU integration)	• Supplies electrical power to the transponder integrated in the ignition key, and transmits random number data. • Verifies the encrypted code which is sent from the transponder. If the code is correct, it sends an engine mobilization signal to the engine-ECU <M/T> or engine-transmission-ECU <Automated manual transmission>.
Engine-ECU <M/T> or engine-transmission-ECU <Automated manual transmission>	Starts the engine, and then continues the engine running if an engine mobilization signal is confirmed. If an engine immobilization signal is confirmed, the ECU cancels the engine control and stops the engine.

Encrypted code registration criteria table

The ignition key contains a transponder (small transmitter), which retains an unique encrypted code. Under any of the conditions below, the encrypted code should be registered in the ETACS-ECU again. The ETACS-ECU can retain maximum eight different encrypted codes. This means that maximum eight ignition keys can be registered.

Component to be replaced	Engine-ECU <M/T> or engine-A/T-ECU <A/T>	ETACS-ECU	Ignition key
Engine-ECU <M/T> or engine-A/T-ECU <A/T> is replaced	–	Should not be replaced	Should not be replaced
			Should be registered again
When engine-ECU <M/T> or engine-A/T-ECU <A/T> is overwritten	–	Should not be replaced	Should not be replaced
			Should be registered again

When ETACS-ECU is replace	Should not be replaced	–	Should not be replaced All ignition keys should be registered again
When ignition key is added	Should not be replaced	Should not be replaced	• Additional ignition key should be registered • All ignition keys should be registered again
When ignition key is lost	Should not be replaced	Should not be replaced	All the ignition keys other than the lost one should be registered again

NOTE: When ETACS-ECU or engine-ECU <M/T> or engine-transmission-ECU <automated manual transmission> is replaced, reinput the vehicle information with the variant coding, using the MUT-III.

LIGHTING

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EXTERIOR LAMPS

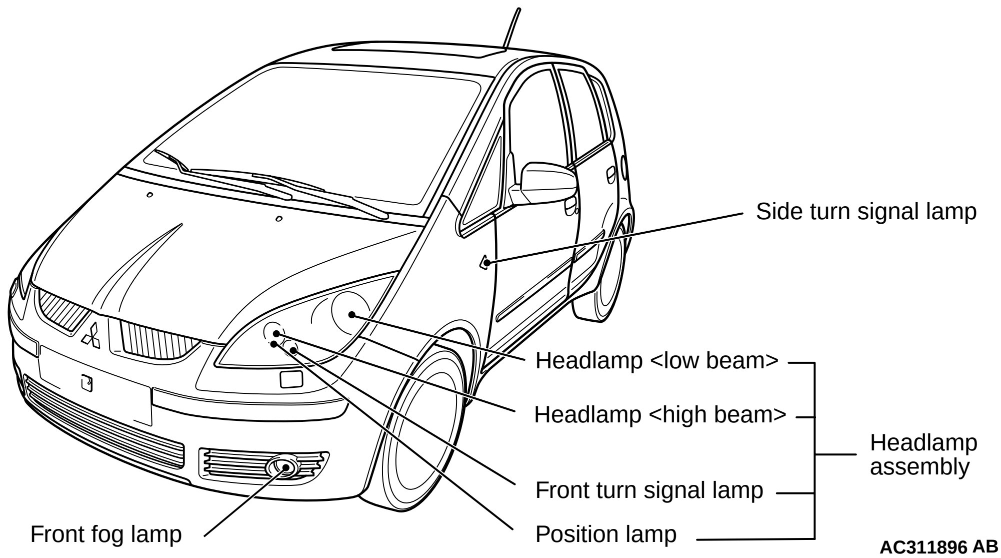
- The headlamp employs the large four-lamp integrated with the front turn signal lamp and position lamp, creating the integrity appearance with the hood. The internal lens design looks like a precision machine, achieving improved appearance.
- A headlamp levelling function is adopted.
- The high mounted stop lamp is standard equipped in order to improve safety.
- The day time running lamp (DRL) is installed as an option.<LH drive vehicles>
- The appearance of the rear combination lamp has been improved by featuring a cut lens and vacuum evaporating the aluminium on the inner area of the lamp.
- The rear fog lamp is adopted.
- A high mount stop lamp has been installed to the tailgate spoiler.

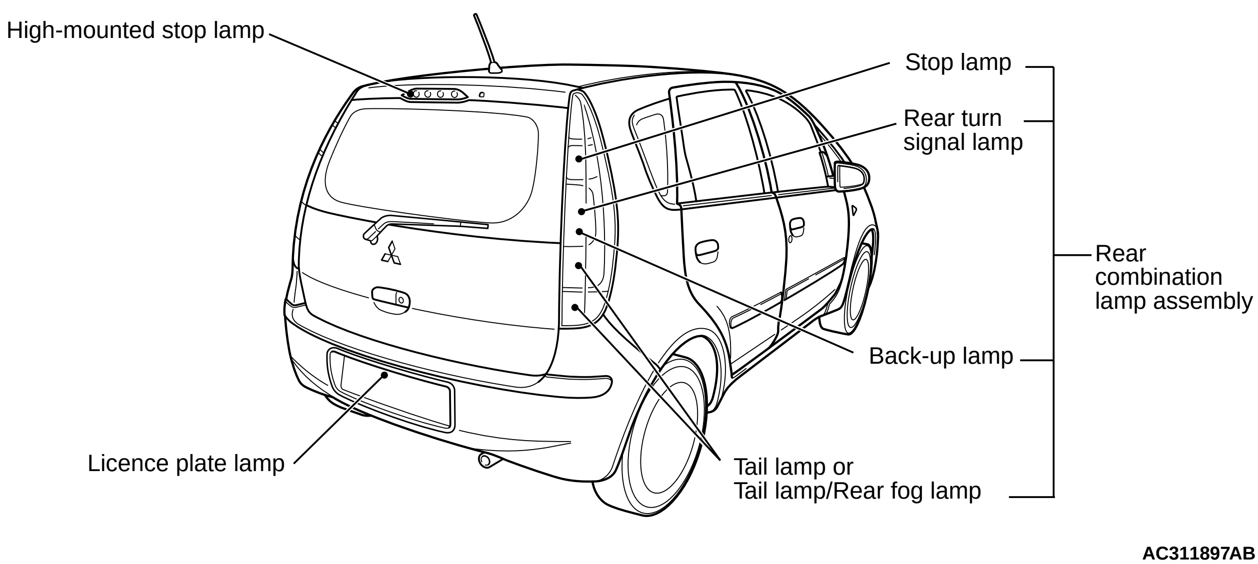
SPECIFICATION

Item		Specification
Headlamp assembly	Headlamp W x number (Halogen bulb)	55 (H7) × 2
	Position lamp W	5
	Front turn signal lamp W	21
Front fog lamp W		55 (H11)
Side turn signal lamp W		5
Rear combination lamp	Tail lamp W <Vehicles without rear fog lamp>	21
	Tail / rear fog lamp W/W* <Vehicles with rear fog lamp>	21/4*
	Stop lamp W	21
	Rear turn signal lamp W	21
	Back-up lamp W	21
High-mounted stop lamp W × number		5 x 4
Licence plate lamp W × number		5 × 2

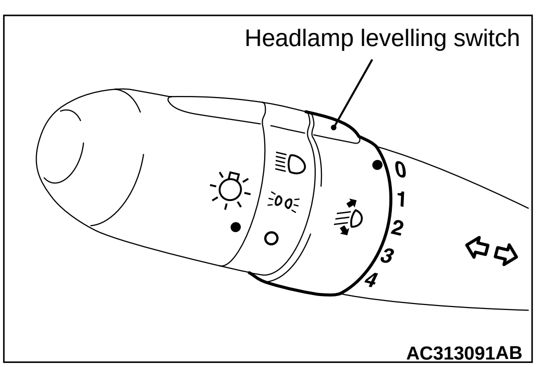
NOTE:
1. *The brackets ( ) show the bulb type.*
2. *: the rear fog lamp is installed in the driver's side only.*

CONSTRUCTION DIAGRAM



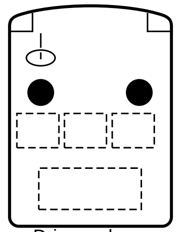
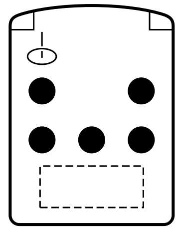
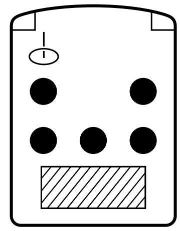
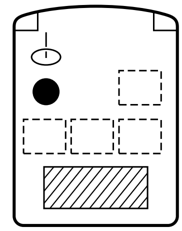


HEADLAMP LEVELING SYSTEM



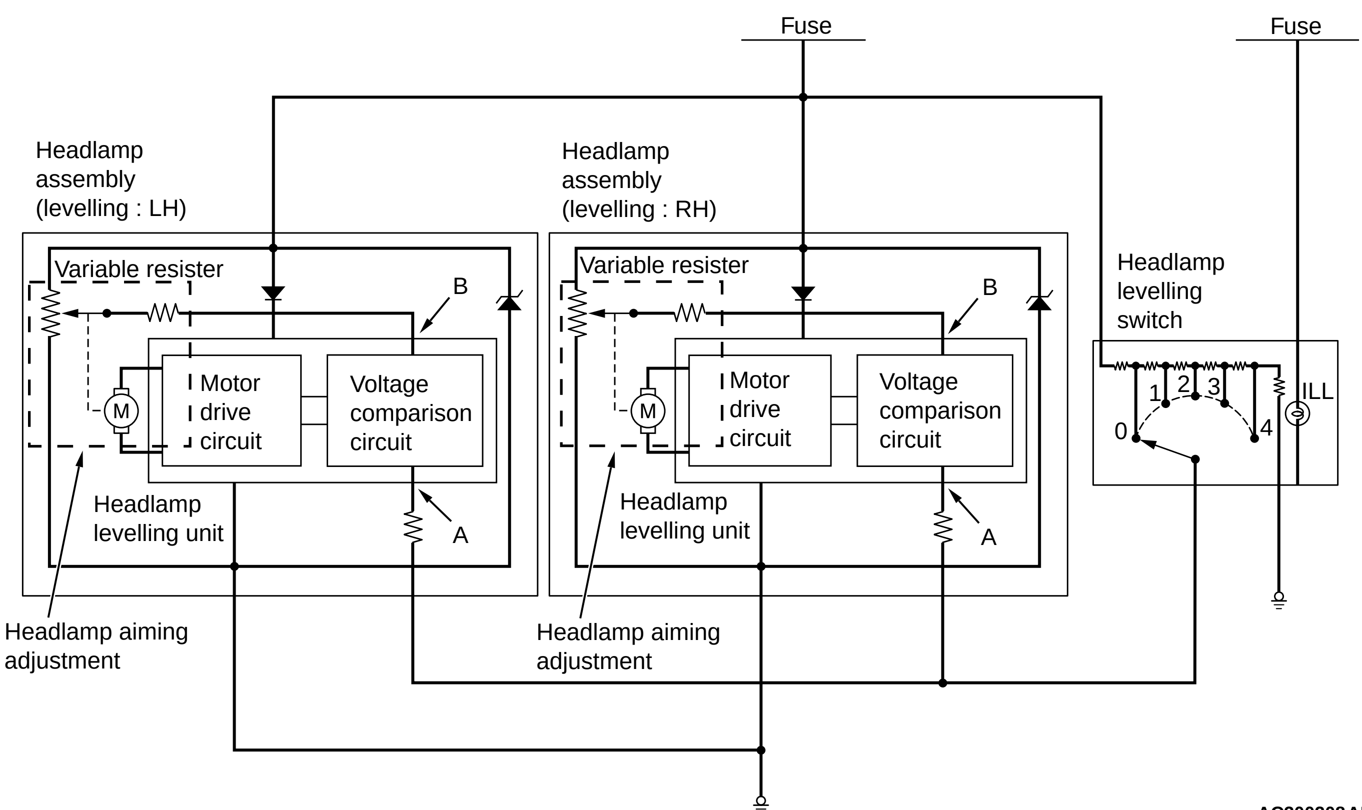
The beam direction of the headlamps changes according to the number of passengers and the amount of load. The headlamp levelling function is a system that allows the driver to change the direction of headlamp beam so that the drivers of oncoming cars are not dazzled by the headlamps. The headlamp levelling switch allows changing the direction in five steps: 0 to 4.

Relationship between the switch positions and the number of passengers/loads

Switch position	0	1	2	3	4
Passenger and load	 Driver only or driver and one passenger AC301941AB	 Driver and four passenger AC301942AB	 Driver and four passenger, and loads AC301943AB	 Driver and heavy loads AC301944AB	When a more load than those to the left is on the vehicle

OPERATION

1. The headlamp levelling switch increases the resistance as it is turned from 0 to 4. Turning the headlamp levelling switch changes the voltage at point A. When the headlamp levelling switch is turned from 0 to 4, the voltage at point A decreases. Upon detection of this voltage change, the headlamp levelling unit turns the motor to lower the beam direction. At this time, the resistance of the variable resistor in the headlamp assembly changes, and the voltage at point B decreases gradually. When the voltages at points A and B become equal, the headlamp levelling unit stops the motor.
2. Turning the headlamp levelling switch from 4 to 0 increases the voltage at point A, and then the headlamp levelling unit turns the motor in the direction opposite to that mentioned in Item 1, increasing the voltage at point B. When the voltages at points A and B become equal, the headlamp levelling unit stops the motor.
3. The headlamp levelling unit detects voltage changes caused by headlamp levelling switch operation, and turns the motor to change the directions of the headlamp deflectors for the adjustment of the headlamp beam direction.



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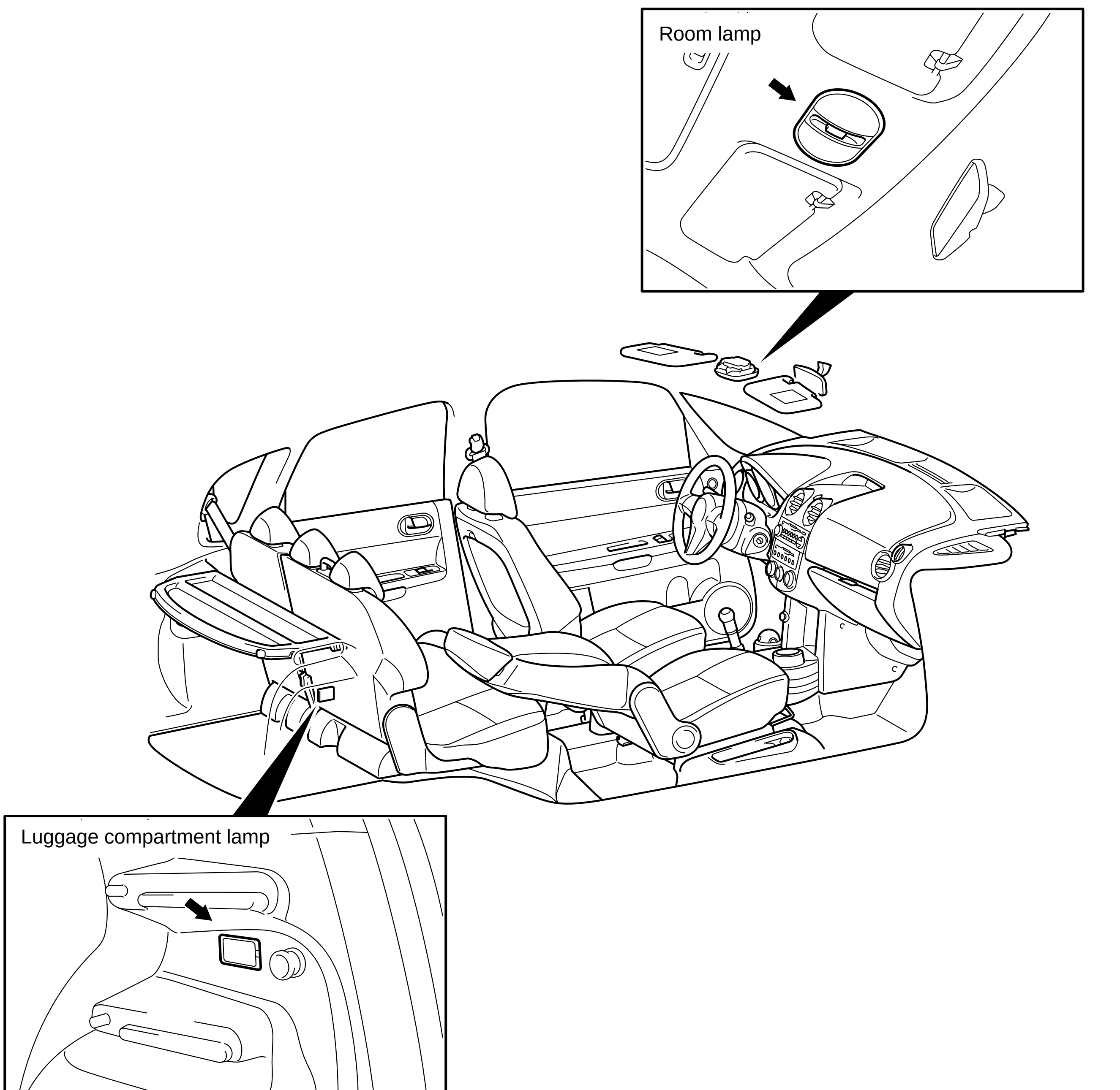
INTERIOR LAMPS

- A room lamp serving also as map lamp which can be used at both the driver's seat and passenger seat is provided.
- A luggage compartment lamp to lamp the back-seat and luggage compartment lamp to lamp the luggage room are provided.

SPECIFICATIONS

Item	Specification
Room lamp W $\times$ number	5.0 $\times$ 2
Luggage compartment lamp W	10

CONSTRUCTION DIAGRAM



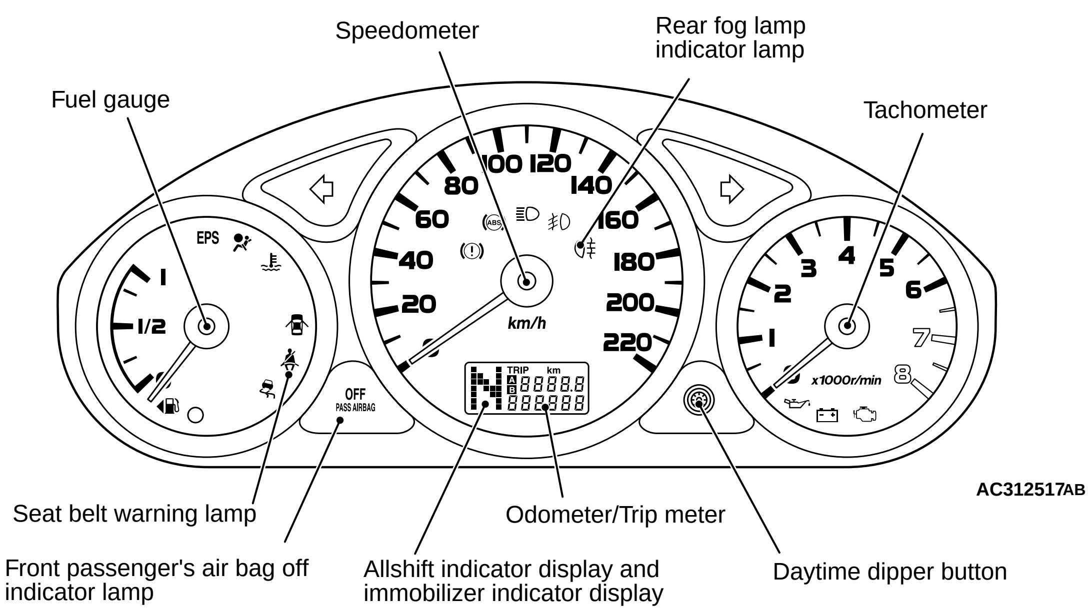
COMBINATION METER

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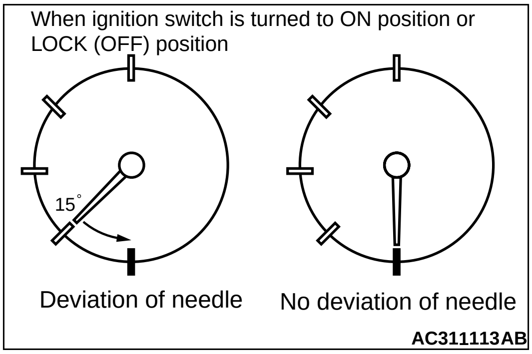
The combination meter features large, clearly visible analogue indicators. Designed to be easy-to-distinguish by drivers, the gauges are arranged with the speedometer in the middle, the fuel gauge at left, and the tachometer at right. The combination meter offers the following advantages.

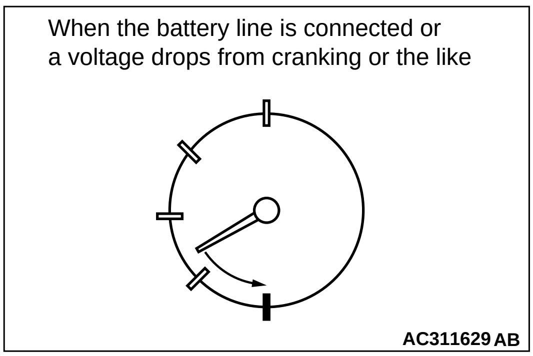
- CAN communication is used for more reliable transmission of all gauge data and indicator lamp input signals, such as vehicle speed, engine RPM, and coolant temperature. For further details on CAN, refer to P.54C-2 GROUP 54C, CAN. The signals that the combination meter uses are described in the CAN communications input signals table .
- Several diagnosis functions such as the diagnosis code memory and actuator tests are prepared in order to improve serviceability.
- The large passenger air bag off indicator is installed in the meter.
- The daytime dipper button is installed in the meter.
- For a brighter display at night and for a longer useful life, all indicator lamps, warning lamps, and illumination bulbs use LEDs.
- The indicators for the speedometer, fuel gauge, and other gauges are driven by a stepping motor. For further details, consult the stepping motor section P.54A-10.
- The electric speedometer is adopted so that it is operated by vehicle speed signals sent from engine-ECU or engine-A-M/T ECU via CAN communication.
- A large and clear LCD type odo-tripmeter is provided. The odometer continuously displays values while the tripmeter adopts a twin-trip (trip A, trip B) function which is switched by a reset button. Also the shift indicator features a clearly visible LCD display.
- Comes with a front and rear fog lamp indication lamps to let the driver know that the fog lamp is on.
- A seat belt warning lamp is installed to encourage the driver to fasten the seat belt.
- The speedometer is an electronic type speedometer which operates by the pulse signal generated by the vehicle speed sensor.
- The fuel gauge is provided with a triangular mark indicating the location of the fuel filler door to clearly that the fuel filler door is on the left side of the car.

CONSTRUCTION DIAGRAM



STEPPING MOTOR





These gauges use a stepping motor as the drive mechanism for the indicators (called the "movement"). Compared with conventional movements, the torque for driving the indicators is much greater for superior indicator accuracy and more stable response. The indicator position displayed is determined as the microcontroller circuit in the gauge controls the stepping motor. In conventional gauges, the indicator revolves 360° in response to 360° driving controls. However, a stepping motor is designed so that the indicator revolves only 45°, even in response to a drive control of 360°. The 45° drive control must be repeated to make the indicator rotate 360°. Thus, at a position 45° away from the indicator display position, there will be an identical control.

As a result, in the case of a great impact such as from an accident when the indicator becomes misaligned, if the ignition is switched on to start driving while the indicator is misaligned, the indicator will function while misaligned. Thus, to return the indicator to the normal position in case this happens, when the ignition is switched on, the indicator positions are reset to their respective positions after the battery line is connected after it is cut. After the battery line is cut and reconnected, the indicators simply return to the zero position. The same operation is performed after voltage is restored if gauge functions are lost because of a voltage drop from cranking or the like. Furthermore, the indicator only returns 45° after the ignition is switched on or the lock is turned off. The indicator is not moved if it is not misaligned.

CAN COMMUNICATION INPUT SIGNALS TABLE

Signal	Transmitter ECU
Ambience temperature signal	ESP
Vehicle speed signal	Engine-ECU or engine-A-M/T-ECU
Tank filling level signal	
Engine speed signal	
Odometer signal	
Charge warning lamp illumination request signal	
Check engine warning lamp illumination request signal	

Signal	Transmitter ECU
Ambience temperature	ETACS-ECU
Illumination signal	
Seat belt reminder/warning lamp illumination request signal	
Oil pressure warning lamp illumination request signal	
Brake warning lamp illumination request signal	
Fuel warning lamp illumination request signal	
High-beam indicator request signal	
Door "Open" signal	
Front or rear fog lamp indicator illumination request signal	
Odometer backup signal	
Turn-signal indicator lamp illumination request signal	
ABS warning lamp request signal	ABS-ECU
Electric power steering warning lamp	Electric power steering-ECU
Communication standby signal	ETACS-ECU
Ignition switch (ACC) signal	
Ignition switch (IG1) signal	

DIAGNOSIS CODE TABLE

Diagnosis code No.	Diagnostic item
U1073	Bus off error
U1100	Engine-ECU CAN communication time-out
U1101	
U1102	ABS-ECU CAN communication time-out
U1106	Electric power steering-ECU CAN communication time-out
U1109	ETACS-ECU CAN communication time-out
U1120	Engine-related CAN communication failure information
U1206	Abnormal communication standby indication flag

MULTI CENTRE DISPLAY

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Multi centre display is installed to display the vehicle information with characters. The multi centre display has the following features.

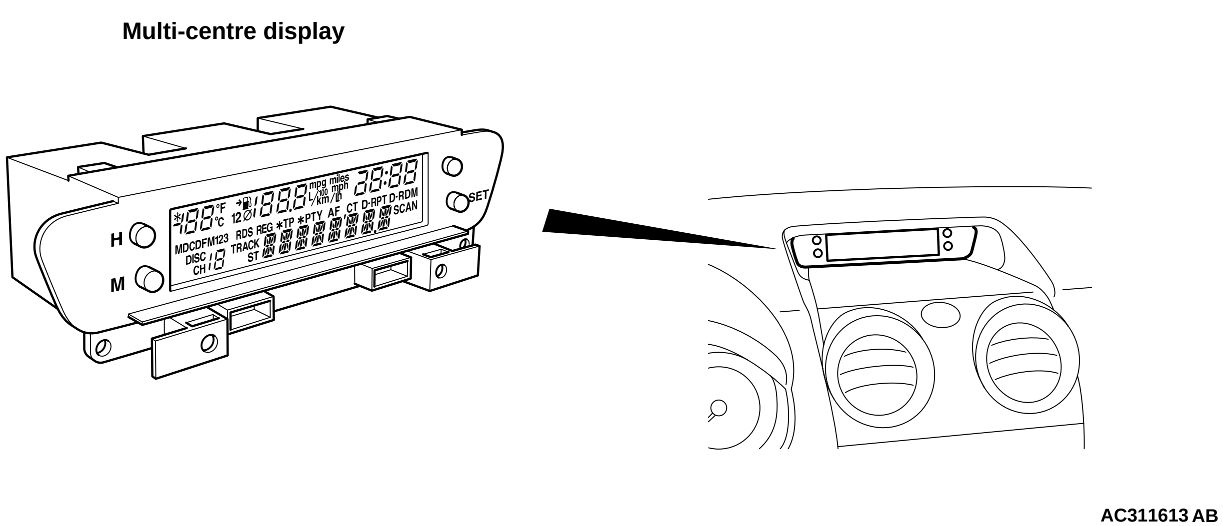
- Clock display
- Outside temperature display
- Vehicle information display* (average speed, instant fuel consumption, remaining distance)
- Audio information display

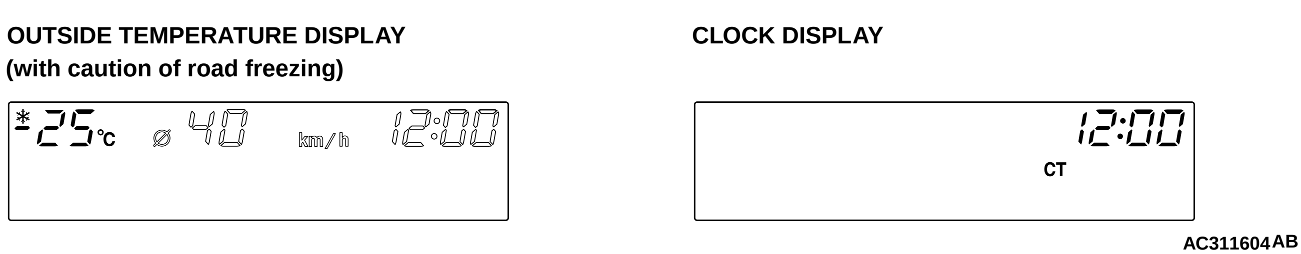
NOTE:

- *The clock is displayed in the screens for all information.*
- **This signal transmission and reception are performed via CAN communication. For CAN details, refer to GROUP 54C P.54C-6.*

Display item			Function
Information item	Clock display		The vehicle with the genuine radio set can adjust its time automatically using the radio control switch.
	Outside temperature display		• The display available range is -40° to 50°. • When the temperature is 3° or less, the temperature display flashes with an alarm for 10 seconds to encourage the freezing prevention.
	Vehicle information display (only for the vehicle with the genuine radio set)	Average speed	Auto reset mode or Manual reset mode can be set optionally for measurement.
		Instant fuel consumption	Auto reset mode or Manual reset mode can be set optionally for measurement.
		Remaining distance (with caution of remaining distance)	When the possible cruising distance reaches approximately 50 km/h (approx. 30 miles), the indicator is displayed with an alarm to encourage refueling.
	Audio information display (only for the vehicle with the genuine radio set)	CD and CD changer mode	Indication of setting status
		Radio mode	Indication of setting status
		RDS (Radio data system)	Program identification search function, Alternative frequencies function, etc
		Volume, tone and valance	BASS, TRE, FAD, and BAL are adjustable.

CONSTRUCTION DIAGRAM





VEHICLE INFORMATION DISPLAY

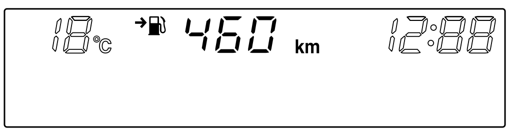
Average speed

Instant fuel consumption



AC311605 AB

Remaining distance
(with caution of remaining distance)



AC311606 AB

AUDIO INFORMATION DISPLAY

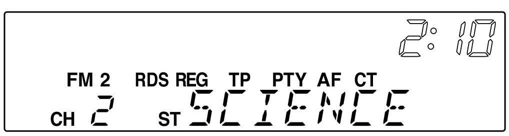
CD and CD changer mode

Radio mode



AC311607 AB

RDS (Radio Data System) display



AC311608 AB

CAN COMMUNICATION INPUT SIGNALS TABLE

Signal	Transmitter ECU
Buzzer sounding request signal	ETACS-ECU
Ignition switch (ACC) signal	
Communication standby signal	

DIAGNOSIS CODE TABLE

Diagnosis code No.	Diagnostic item
U1073	Buss-off
U1100	Loss of "Engine" ECU Message (Timeout) or not equipped
U1102	Loss of "Active Stability Control System/TL/ABS" ECU Message (Timeout) or not equipped
U1108	Loss of "Combination Instrument" Module Message (Timeout) or not equipped
U1109	Loss of "ETACS" ECU Message (Timeout) or not equipped
U1120	Fail Information from Engine Module
U1122	Fail Information from Active Stability Control System/TCL/ABS ECU
U1128	Fail Information from Electric power steering-ECU

Diagnosis code No.	Diagnostic item
U1600	MBUSY open
U1601	MBUSY short
U1602	MDATA open
U1603	MDATA short
U1604	MSCK open
U1605	MSCK short

RADIO AND CD PLAYER, ANTENNA

M2540006000325

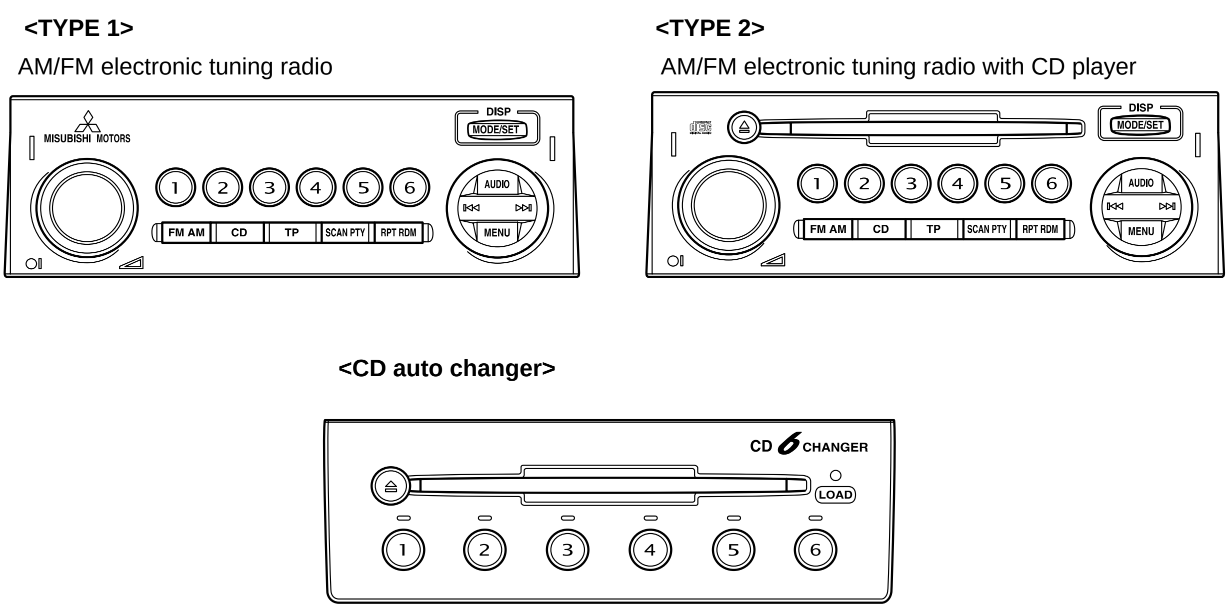
RADIO AND CD PLAYER

The following functions are installed an options. The CD player can play both CD-R and CD-RW.

SPECIFICATION

Item	TYPE 1 AM/FM electronic tuning <option>	TYPE 2 AM/FM electronic tuning radio with CD player <option>
Power amplifier with radio	General 140 W	General 140 W
RDS (radio data system) function	Available	Available
CD changer (6 disc CD) <option>	Setting is available	Setting is available

CONSTRUCTION DIAGRAM



AC311918AB

SPEAKER

The speaker can be selected between 4-speaker and 6-speaker as an option.

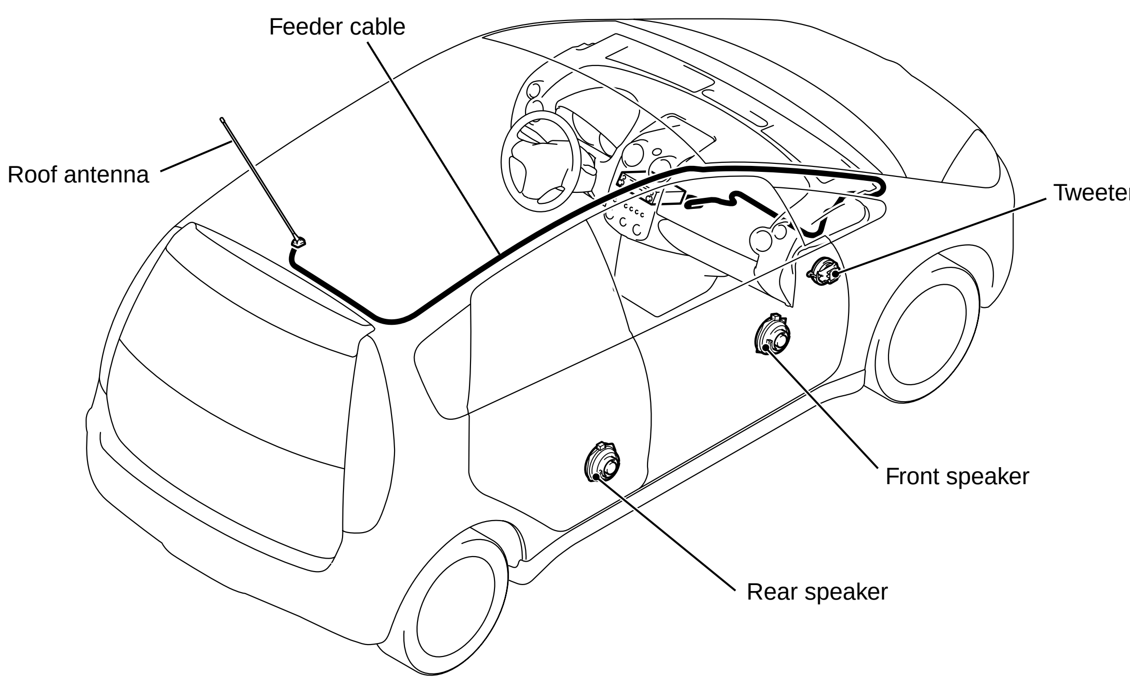
SPECIFICATION

Location	Four speakers <option>	Six speakers< option>
Front door	-	Equipped (tweeter – 3.5 cm)
	Equipped (dual cone full range – 16 cm)	Equipped (dual cone full range – 16 cm)
Rear door	Equipped (dual cone full range – 13 cm)	Equipped (dual cone full range – 13 cm)

ANTENNA

Featuring a roof antenna.

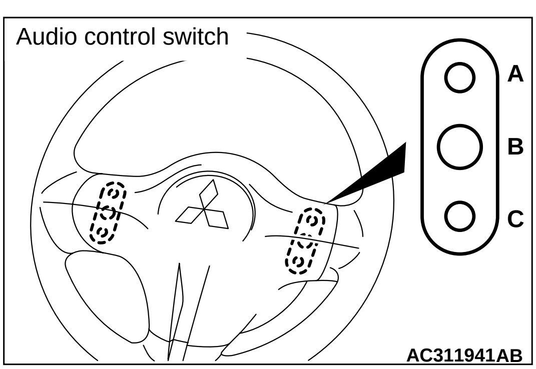
CONSTRUCTION DIAGRAM



AC311927AC

*NOTE: The * indicates equipped on the left and right sides.*

REMOTE CONTROLLED RADIO SWITCH



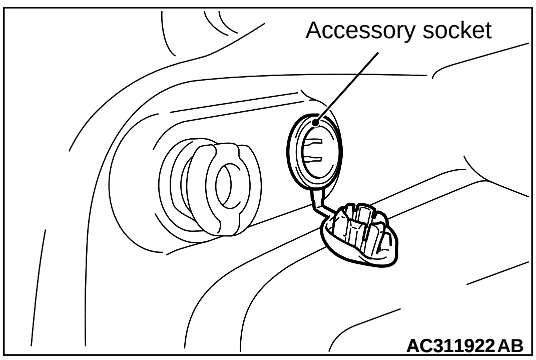
The remote controlled radio switch is installed on the back of steering wheel so that the driver can control the audio while holding the steering wheel during driving.

Position	LH hand		RH hand	
Function	Radio	CD	Radio	CD

Position	LH hand		RH hand
A	Seek up	Track up	Volume up
B	Memory channel selection	Disk up change	Mode change
C	Seek down	Track down	Volume down

ACCESSORY SOCKET

M2540008000149



Power sockets for electrical accessories are located on left corner of the luggage compartment. When using one accessory socket alone, the maximum load is up to 120W.